

“On the Stellar Line near λ 4686.” By Sir NORMAN LOCKYER, K.C.B., LL.D., Sc.D., F.R.S., and F. E. BAXANDALL, A.R.C.Sc. Received January 4,—Read February 9, 1905.

[PLATE 13.]

In the publication of the results derived from a study of the Kensington photographic spectra of the 1898 eclipse, it was stated* that a fairly prominent line recorded near λ 4686, for which no terrestrial origin could be found, agreed closely in position with a well-marked line of unknown origin in one of the Kensington photographs of the spectrum from a helium tube. In the helium photograph the position has been recently found from careful measures made on the lines 4120·97, 4388·10, 4713·25, and the line in question, and subsequent use of Hartmann's formula.

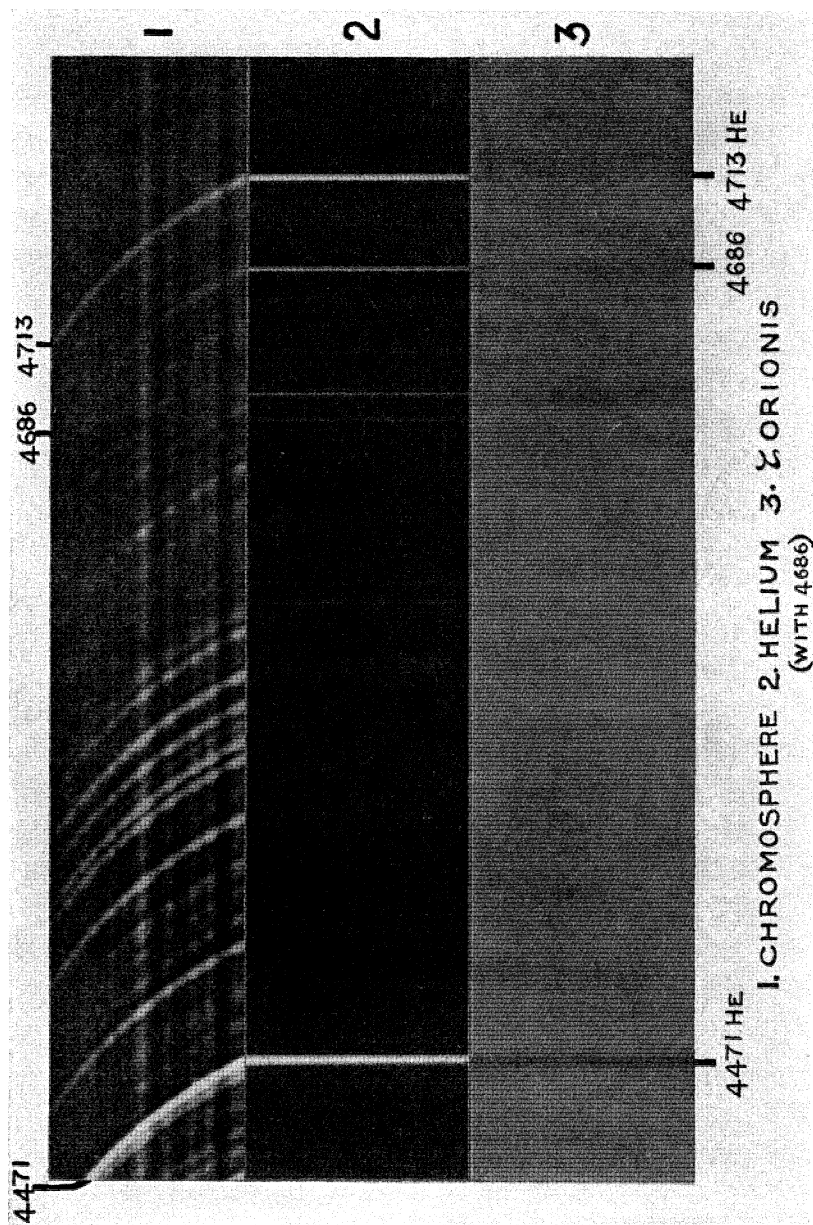
The resulting wave-length of the strange line was 4685·97. Similar measurements were made on the eclipse photographs, the fiducial lines used being 4508·5 (*p* Fe), 4584·0 (*p* Fe), and 4713·25 (He). The result gave 4685·90.

The two calculated wave-lengths so nearly agree that it is very probable the line is of identical origin in the two cases. The eclipse line is, moreover, of the same nature as the helium eclipse lines, long and sharply defined. It would therefore seem that the line is due to a gas which is associated in some way with helium. The line, however, only appears in one photograph of the helium spectrum, and whether this is due to the particular sample of helium used, or to some special condition of current which is conducive to the appearance of the strange line, it is impossible to say.

A line near the same position has been recorded by various spectroscopists in different celestial spectra. The following table contains the available records of the line in question:—

Spectrum.	Observer.	λ .
Bright line stars	Campbell	4688
" "	Pickering	4688
" "	McClean	4687·5
Nebulae	Campbell	4687
Orion stars	Pickering	4685·4
ϵ Orionis	Lockyer	4687·0
Trapezium star (Bond 628)	Keeler	4685·4
β Crucis	McClean	4685·1
Chromosphere	Evershed	4685·7
" "	Lockyer	4687·0
" "	Frost	4685·7
" "	Lord	4686·3
" "	Humphreys	4685·4
	Mean λ ..	4686·4

* ‘Phil. Trans.,’ A, vol. 197, p. 202.



It will be seen that the mean wave-length is in fairly good accord with that of the unknown terrestrial line 4685.97. The line, however, in the nebular and bright-line-star spectra is broad and ill-defined, and the estimated wave-lengths are probably somewhat uncertain, and not to be depended on so much as those obtained from spectra in which the line is sharply defined. If in seeking the mean wave-length these probably less accurate wave-lengths be excluded, the result is 4685.9, which is in very close agreement with the position of the terrestrial line.

Rydberg has shown that the stellar line near 4686—associated with the new series discovered by Pickering in the spectrum of ζ Puppis—is probably the first line of the principal series furnished by hydrogen. His calculated wave-length value for the line is 4687.88,* which would appear to be about two tenth-metres in error, as the corresponding celestial line probably has, as is shown in the present note, a wave-length near 4685.9.

In the light of this evidence for the probable identity of the terrestrial and stellar lines, it seems desirable to institute further research on the spectrum of helium under varying electrical conditions, with the object of possibly obtaining the terrestrial equivalents of the so-called new hydrogen series of ζ Puppis.

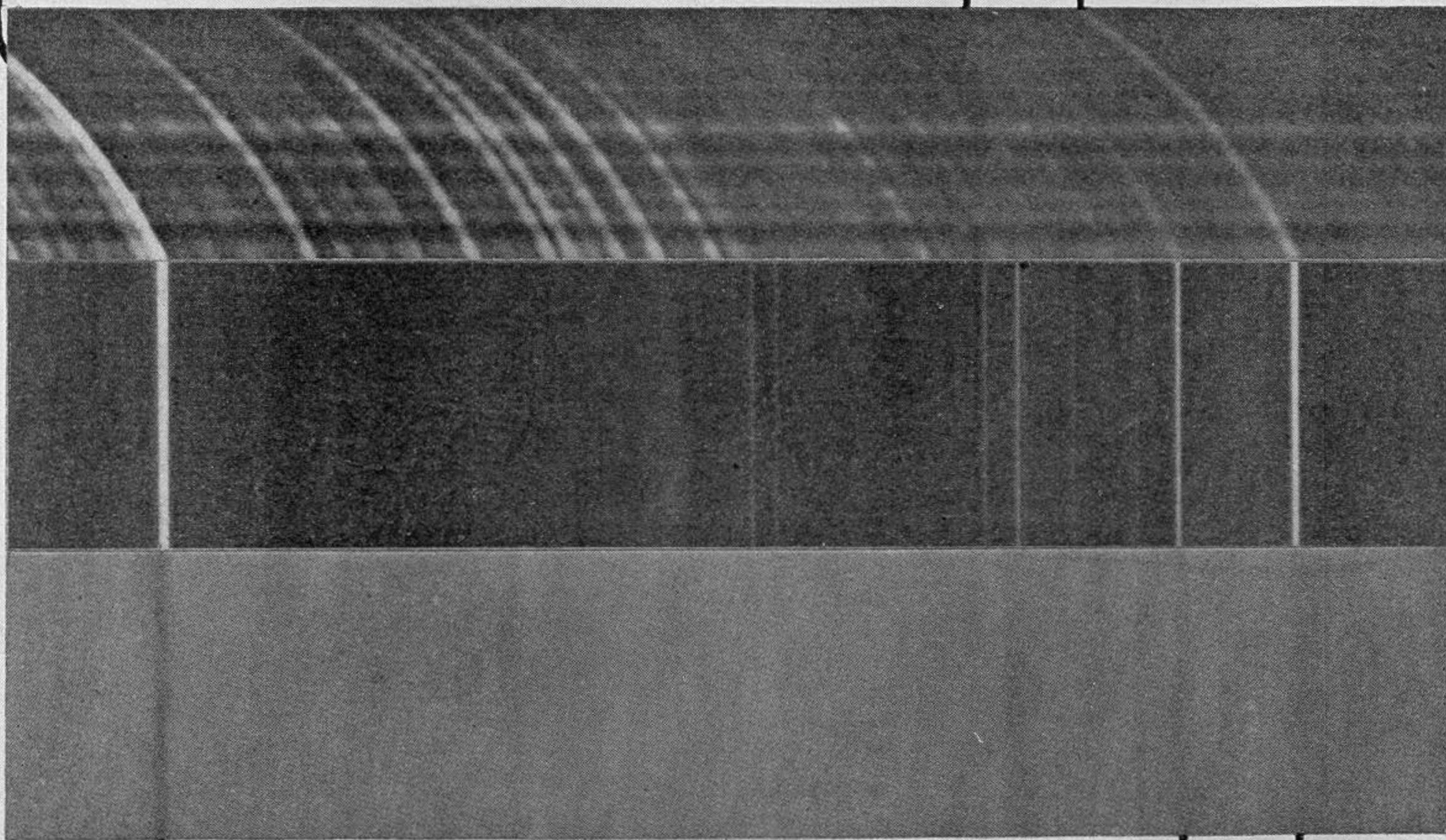
DESCRIPTION OF PLATE.

The plate shows a comparison of the spectrum (region 4450 to 4750) of the chromosphere, the helium spectrum containing the line 4686, and that of ζ Orionis (Alnitamian). The identity of position of the helium lines, and 4686, with lines in the chromospheric and stellar spectra is clearly shown. The fainter lines in the helium spectrum are all due to oxygen.

* 'Ast. Phys. Jour.,' vol. 6, p. 237.

4471

4686 4713



1

2

3

4471 HE

4686 4713 HE

1. CHROMOSPHERE 2. HELIUM 3. ζ ORIONIS
(WITH 4686)